Verification of MENDL2 and IEAF-2001 Data Bases at Intermediate Energies

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The work presents results on computer simulations of two experiments whose aim was measuring the threshold activation reaction rates in ^{12}C, ^{19}F, ^{27}Al, ^{59}Co, ^{63}Cu, ^{65}Cu, ^{64}Zn, ^{93}Nb, ^{115}In, ^{169}Tm, ^{181}Ta, ^{197}Au, and ^{209}Bi thin samples placed inside and outside a 0.8-GeV proton-irradiated 4-cm thick W target and a 92-cm thick W-Na composite target of 15-cm diameter both. In total, more than 1000 values of activation reaction rates were determined in both experiments. The measured data were compared with results by the LAHET code using several nuclear data bases for the respective excitation functions, namely, ENDF/B6 for cross section of neutrons at energies below 20 MeV and MENDL2 together with MENDL2P for cross sections of protons and neutrons of 20 to 100 MeV energies. The recently developed IEAF-2001 data base that provides neutron cross sections up to 150 MeV was used as well. Simulation-to-experiment results obtained using MENDL2 and IEAF-2001 are presented. The agreement between simulation and experiment was found satisfactory for both data bases. Nevertheless, further studies should be conducted to improve simulations of the production of secondary protons and high-energy neutrons, as well as the high-energy neutron elastic scattering. Our results allow drawing some conclusions concerning the reliability of the transport codes and data bases used to simulate Accelerator Driven Systems (ADS), particularly with Na-cooled W targets. The high-energy threshold excitation functions to be used in activation-based unfolding of neutron spectra inside the ADS can be also inferred from our results.

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